

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

Elizabetta CARREA

Application No.: 10/814,167

Filing Date: 1 April 2004

For: Combustion Process, in particular for a Process for  
Generating Electrical Current and/or Heat

Art Unit: 3749

Examiner: Price, Carl

Attorney Ref. No.: 003-127

**Via EFS-Web**

**BRIEF FOR APPELLANT**

**Mail Stop APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

COMES NOW APPELLANT to present this Brief in support of the appeal of the final rejection of Claims 1-28 in the above-captioned patent application. The Notice of Appeal having been timely filed on 8 May 2007, this Brief is due to be filed on 8 September 2007, with the concurrently filed Petition for a two-month extension of time. 37 C.F.R. §§ 1.7(a), 41.37 (a)(1), (e).

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application or dismissal of this appeal, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to Deposit Account 50-2821.

For the following reasons, Appellant respectfully submits that the final rejection of each of Claims 1-28 in this application is in error, and therefore respectfully requests reversal of the rejections.

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**I. REAL PARTY IN INTEREST**

The real party in interest in this application is ALSTOM Technology, LTD, a corporation of Switzerland.

**II. RELATED APPEALS AND INTERFERENCES**

There are no appeals or interferences related to this application or appeal.

**III. STATUS OF CLAIMS**

All of the pending claims, Claims 1-28, stand finally rejected in the Office Action dated 8 December 2006 ("Office Action"); no claims have been cancelled. The rejection of all of Claims 1-28 is the subject of this appeal.

**IV. STATUS OF AMENDMENTS**

All amendments to the claims have been entered.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

This application describes and claims unique methods and devices embodying principles of the invention. Figure 1 of the application has been reproduced herein to assist in an understanding of aspects of the invention, with the assistance of an exemplary embodiment.

**Claim 1:** A combustion process comprises forming a substantially nitrogen-free gas mixture from oxidant Ox [Fig. 1; page 5, lines 16-29], fuel F [Fig. 1; page 6, lines 11-13], and inert gas  $G_{ER}$ ,  $G_{IR}$  [Fig. 1; page 5, lines 16-29; page 6, lines 17-24], and combusting said gas mixture in a burner 3 [Fig. 1; page 6, lines 7-8; page 7, lines 2-19], wherein combusting comprises flameless combustion [*id.*].

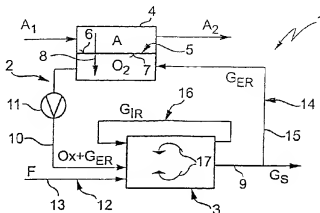


Fig. 1

**Claim 12:** An installation useful for carrying out such a process can comprise a mixture forming device 2, 18 [Figs. 1, 2, 3; page 5, lines 15-16; page 8, lines 7-16] configured and arranged for the formation of a substantially nitrogen-free gas mixture of oxidant Ox, fuel F, and inert gas  $G_{ER}$ ,  $G_{IR}$  [*id.*], and a burner 3 configured and arranged for carrying out flameless combustion [page 7, lines 2-9; page 10, lines 7-14], the mixture forming device configured and arranged to bring oxygen and fuel together in the burner first to form a gas mixture having a temperature above the self-ignition temperature of said gas mixture [*Id.*].

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed in this appeal is the rejection of Claims 1-28 under 35 U.S.C. § 103(a).

## VII. ARGUMENTS

### A. Introduction

In the Office Action, beginning at page 5, Claims 1-28 were rejected under 35 U.S.C. § 103(a), as reciting subject matters that allegedly would be obvious in view of the prior art. More specifically, Claims 1, 2, 4-10, 22-25, and 28 were rejected under section 103(a) over the hypothetical combination of disclosures from U.S. Patent No. 5,724,805, issued to Golomb *et al.* (“Golomb”) in view of that from U.S. Patent No. 5,154,599, issued to Wunning. Additionally, Claims 3, 12-14, 16, 20, 21, and 25 were rejected under section 103(a) over the hypothetical combination of disclosures from *Golomb* and *Wunning*, and further in view of that from Japanese patent document number 10-89614 (“JP-614”). Claims 11 and 15 were rejected under section 103(a) over the hypothetical combination of *Golomb*, *Wunning*, and *JP-614*, and further in view of U.S. Patent No. 6,497,098, issued to Griffin *et al.* (“Griffin”). Lastly, Claims 17-19 were rejected under section 103(a) over the hypothetical combination of *Golomb*, *Wunning*, *JP-614*, and *Griffin*, and further in view of those of U.S. Patent No. 5,636,977, issued to Benson *et al.* (“Benson”). For at least the following reasons, these rejections are in error and should be reversed.

Independent Claims 1 and 12 stand or fall separately; the remaining dependent claims stand or fall with the claim from which each depends.

To simplify consideration of the rejections of the various claims, the prior art document relied upon in the Office Action will be discussed after a brief review of the law of obviousness under section 103.

*B. Legal Standards*

Claim construction begins with the words of the claims. *Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 971 (Fed. Cir. 1999). Claim language should be interpreted as one reasonably skilled in the art would have interpreted the claim at the time of the patent application date. *Vivid Techs., Inc. v. American Science & Engineering, Inc.*, 200 F.3d 795, 804 (Fed. Cir. 1999); *Wiener v. NEC Elec., Inc.*, 102 F.3d 534, 539 (Fed. Cir. 1996). Where the claim term has no specialized meaning to persons of skill in the art, the ordinary meaning of the words to those of ordinary skill in the art controls, unless the evidence indicates that the inventor used them differently. *Karlin*, 177 F.3d at 971. Such evidence includes the specification and prosecution history, both of which must be analyzed to determine if the inventor limited or redefined any of those terms. *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882-84 (Fed. Cir. 2000); *Vivid Techs.*, 200 F.3d at 804. If claim language is not clear on its face, then intrinsic evidence also should be consulted to resolve the lack of clarity. *Interactive Gift Express, Inc. v. Compuserve, Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001).

A patent claim is invalid for obviousness if the differences between the claimed subject matter and the prior art are such that the claimed subjected matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the relevant art. 35 U.S.C. § 103(a). The determination of obviousness is a legal conclusion based on underlying factual considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966). These factual inquiries include: the scope and content of the prior art; the differences between the prior art and claims at issue; the level of ordinary skill in the pertinent art; and objective evidence of nonobviousness (*i.e.*, secondary considerations). *Graham*, 383 U.S. at 17; *KSR International Co. v. Teleflex Inc. et al.*, 550 U.S. \_\_\_, No. 04-1350, slip op. at 2 (April 30, 2007); *Brown & Williamson Tobacco Corp. v. Phillip Morris Inc.*, 229 F.3d 1120, 1124 (Fed. Cir. 2000); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356 (Fed. Cir., 2006).

It is against this factual background that the ultimate determination of obviousness is made, *i.e.*, the claimed invention is obvious if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the art. 35 U.S.C. § 103(a). “In line with th[e] statutory standard [of 35 U.S.C. § 103], [the] case law provides ‘[t]hat consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art.’ Two requirements are contained in this criterion.” *Brown & Williamson Tobacco Corp.*, 229 F.3d at 1124 (*quoting In re Dow Chem.*, 837 F.2d 469, 473 (Fed. Cir. 1988)).

The U.S. Supreme Court recently addressed the obviousness of a combination of known elements. Although a rigid application of the Court of Appeals for the Federal Circuit’s “teaching, suggestion, or motivation” (“TSM”) test was rejected, the Court stated that “a combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR, slip op.* at 12. For example, the Court explained, when the prior art elements work together in an unexpected and fruitful manner, a finding of non-obviousness is supported. *Id.* (*citing United States v. Adams*, 383 U.S. 39, 40 (1966)). If, however, the combination of old elements does no more than they would in separate, sequential operation, even though the combination might perform a useful function, the combination is likely obvious. *Id.* at 13 (*citing Anderson’s-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969)). Finally, the Court stated that “[i]f a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability.” *Id.* (*citing Sakraida v. AG Pro, Inc.*, 425 U.S. 273 (1976)). Nevertheless, the Court in *KSR* still required that there be a reason or purpose for modifying the prior art to arrive at the claimed invention, in order to find the claimed subject matter unpatentable under section 103(a). *Id.* at 14-15 (“Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important

to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.”).

Thus, while the Supreme Court in *KSR* ruled that the requirement, in the jurisprudence of the Court of Appeals for the Federal Circuit, for a “teaching, suggestion, or motivation” to make up for the deficiencies in the prior art to meet the claimed invention, cannot be rigidly applied, the Federal Circuit had already articulated that its test was flexible. *See, e.g., DyStar Textilfarben*, 464 F.3d at 1367 (“Our suggestion test is in actuality quite flexible and not only permits, but *requires*, consideration of common knowledge and common sense”) (emphasis in original); *Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1291 (Fed. Cir. 2006) (“There is flexibility in our obviousness jurisprudence because a motivation may be found *implicitly* in the prior art. We do not have a rigid test that requires an actual teaching to combine . . .”) (emphasis in original). It is therefore plain that *KSR* did not reject the TSM test, but only its rigid application to the facts before the Court in that case, and it is thus still a requirement for a rejection under section 103 during *ex parte* prosecution of a patent application, that there be some rational reason articulated by the PTO why a person of ordinary skill in the art would modify the prior art to arrive at the claimed invention. *Accord Ex parte Catan*, \_\_\_ U.S.P.Q. \_\_\_, Appeal No. 2007-0820, slip op. at 11 (U.S.P.T.O. Bd. Pat. App. & Int., July 3, 2007) (*quoting In re Kahn*, 441 F.3d 977, 988, (Fed. Cir. 2006)) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”); *id.*, slip op. at 19-21 (articulating motivation to modify one prior art device to arrive at the claimed invention).

### C. The prior art

#### (i) Golomb

*Golomb* describes a power plant design which produces no nitrous oxides (NO<sub>x</sub>). Figure 1 of *Golomb* is reproduced herein to assist in a better understanding of *Golomb*’s disclosure, and



has been annotated to add labels from *Golomb's* description for some of the elements.

An Air Separation and CO<sub>2</sub> Capture (AS/CC) Unit is supplied with air, which unit separates from the air (liquid) CO<sub>2</sub> for recycling, water (H<sub>2</sub>O), pure oxygen (O<sub>2</sub>), and gaseous CO<sub>2</sub> (column 4, line 49 to column 5, line 4) on a permeate

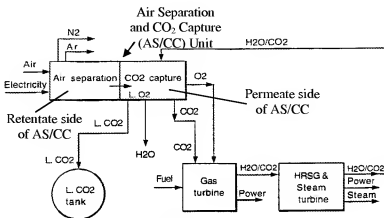


FIG. 1

side of the unit. The gaseous CO<sub>2</sub> and the oxygen are fed into a gas turbine with fuel, and combusted in a typical manner with a flame, which produces power and combustion products of water and gaseous CO<sub>2</sub>. The water and carbon dioxide gas are then cooled in a Heat Recovery Steam Generator ("HRSG"), which extracts more power from the hot gases from the turbine in a typical co-generation setup. The somewhat cooled working fluid (water and carbon dioxide) from the HRSG is then recycled back to the permeate side of the AS/CC, where it is available to again be used as a working fluid in the gas turbine.

In addition to passing oxygen to the permeate side, the AS/CC maintains nitrogen (N<sub>2</sub>) and argon (Ar) on the retentate side of the unit; the nitrogen gas is either vented to the atmosphere or retained and sold as a process by-product (column 5, lines 35-39). *Golomb* makes clear that the combustion of the fuel, whether natural gas (NG) or synthesis gas (SG), with the oxygen produces a flame (column 6, lines 36 - 38; column 10, lines 6-16). *Golomb* eliminates the possibility that NO<sub>x</sub> is produced in the combustor, by eliminating nitrogen gas in the pre-combustion gases (column 2, line 12; column 5, lines 36-39; column 14, lines 18-19).

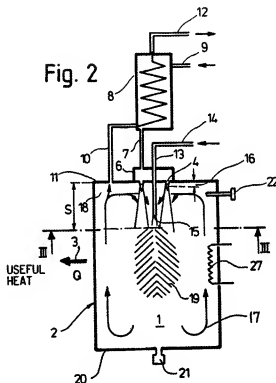
The rest of *Golomb's* disclosure, in particular that related to Figure 5, relates to fine details of the recycling of carbon dioxide, and the use of liquefied oxygen and nitrogen to cool various parts of the system. Short shrift is given in *Golomb's* disclosure to the combustor 20, the

turbine 20', and the compressor 27', other than to indicate that oxygen and fuel are introduced into the combustor without any nitrogen, and that combustion is performed with a flame.

(ii) *Wunning*

*Wunning* describes combustion chambers that benefit from flameless oxidation or combustion of a fuel with air to produce extremely low levels of  $\text{NO}_x$ . With reference to Figure 2 of *Wunning*, which is representative of *Wunning*'s several species and reproduced herein to assist in a better understanding thereof, a combustion chamber 2 includes air nozzles 4 which direct air into the chamber. Fuel is delivered into the combustion chamber 2 through a conduit 14 which leads to a nozzle 15 inside the chamber 2. Before the combustion air enters the combustion chamber 2, however, it is first heated in a preheater 8, passes through an air line 7 to a housing 6, and is then distributed to the several nozzles 4. The preheater 8 receives combustion products, e.g., hot gas, via a conduit 10 that is in communication with the interior of the combustion chamber 2. The amount of preheating of the combustion air is such that the temperature of the air is above the self-ignition temperature of the air-fuel mixture, which can result, in the combustion chamber 2, in the phenomenon known as flameless oxidation or combustion. Figures 6 and 7 describe an embodiment in which a flameless combustor (regenerator burner) 60 is mounted in the wall 30 of a furnace.

*Wunning* explains why his invention reduces  $\text{NO}_x$  formation in a combustion chamber at column 2, lines 36-50:



Briefly, the procedure in the method according to the invention is that exhaust gases from combustion, from which useful heat dissipated to the outside from the system has previously been withdrawn, are mixed with the preheated combustion air at a combustion exhaust gas recirculation ratio of  $r \geq 2$  (the exhaust gas recirculation ratio is defined as the ratio between the flow rates of the recirculated exhaust gas and of the combustion air supplied), and this mixture of exhaust gas and combustion air is kept at a temperature that is higher than the ignition temperature, and the mixture of exhaust gas and combustion air is then brought together with the fuel, forming an oxidation zone in which a substantially flameless, pulse-free oxidation occurs in the combustion chamber.

*Wunning* goes on at lines 58-67:

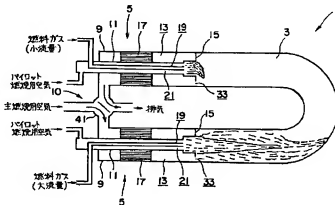
This method operates with an extremely high rate of exhaust gas recirculation ( $r \geq 2$ ), so that even with complete air preheating ( $\epsilon=1$ ), the maximum temperatures ( $1500^{\circ}\text{C.}$ ) that occur upon oxidation are lower than in the case of combustion of the fuel in flames. Despite high air preheating and thus optimal exploitation of the exhaust gas heat, the  $\text{NO}_x$  values occurring in flameless oxidation are lowered to far below the values that would occur if the fuel were combusted with flames without preheating of the combustion air.

*Wunning* discusses an example at column 9 which achieves less than 10 parts per million (PPM)  $\text{NO}_x$  in the exhaust gas after flameless combustion of natural gas with air. *Wunning* further summarizes the benefits of flameless combustion with air (*see* column 12, lines 50-56), stating:

The devices, described in various embodiments in conjunction with FIGS. 2 to 9, for carrying out the substantially flameless, pulse-free oxidation method are distinguished by the fact that the nitrogen oxide emissions are reduced to a practically negligible minimum with high combustion air preheating and thus excellent exploitation of the energy in the fuel.

## (iii) JP-614

JP-614 is in Japanese, with only a short English language Abstract having been provided to Appellant; Figure 1 of JP-614 has been reproduced herein to assist in an understanding of its disclosure. The Abstract states:



The burner (1) has a U-shaped radiation tube (3) arranged with air nozzles (33). The unit cross-section heat load air flow velocity for the section area of the tube depends on the discharge flow rate of the combustion air from each nozzle and the amount of combustion of the burner. The heat load air flow velocity is set above an arbitrary numerical value e.g. 0.17 meters per second per kilocalorie per square centimeter-hour.

ADVANTAGE - Controls formation of nitrous oxide. Provides simple and inexpensive structure. Increases thermal efficiency of radiation tube heating system. Uses ceramics to improve heat resistance. Eliminates use of pilot burner. Facilitates combustion even if temperature of preheated air is more than spontaneous ignition temperature of fuel. Enables effective exhaust gas recirculation. Reduces oxygen concentration due to separate arrangements of air and fuel nozzles. Two or more burners can be arranged in tube to ensure uniform temperature and combustion flame distribution. Eliminates cracking of tube, hence extending durability and reducing loss.

(emphasis in original)

*D. The rejections of Claims 1-28 under section 103(a) are in error*

(i) The rejections of Claims 1-11 and 22-24 are in error

The rejections of Claims 1-11 and 22-24 under 35 U.S.C. § 103(a) are in error.

Appellant first notes that the Office Action does not differentiate between the subject matters of the claimed methods (Claims 1-11 and 22-24) and those of the claimed apparatus (Claims 12-21 and 25-28). The claimed methods are not limited to the particular structures

recited in the combinations of the apparatus claims; the Office Action does not treat them differently. Thus, a *prima facie* case has not been made concerning the method claims, at least because each and every feature recited in the method claims has not been identified in the prior art.

Assuming *arguendo* that all of the claimed method steps are found between *Golomb* and *Wunning*, a *prima facie* case of obviousness of the claimed combinations has not and can not be made. The rejections in the Office Action are, instead, driven by a hindsight reconstruction of Appellant's own invention using their own specification as a guide, exactly the impermissible hindsight that the U.S. patent jurisprudence, including *KSR*, prohibits. From the beginning of this invention, the inventor, now Appellant, looked to solve the vexing problem of combusting a gas mixture that has extremely low levels of oxidant, while simultaneously combatting the problem of NO<sub>x</sub> generation. Only she solved this problem with the elegant solution represented by the subject matter recited in Claim 1. In the original specification of this application, she writes:

The invention is based on the general idea of using the flameless combustion, which is known for the reduction of NO<sub>x</sub> emissions, for the combustion of a nitrogen-free gas mixture. It may be easily recognized that the use of a method operating with flameless combustion and recognized for the reduction of the NO<sub>x</sub> emissions apparently takes place without motive in the case of a nitrogen-free combustion process, which therefore operates without NO<sub>x</sub> emissions, because the combustion process operating nitrogen-free cannot be improved with respect to its NO<sub>x</sub> emission figures. The invention uses the knowledge that a combustion method operating with flameless combustion is suitable, in a particular manner, for the combustion of weakly reactive gas mixtures. Where a weakly reactive gas mixture is to be burnt, in particular where the oxygen of the gas mixture to be burnt is obtained by means of an oxygen transport membrane with rather large scavenging gas quantity, the output capability of the combustion process operating nitrogen-free can be distinctly improved by the combination, according to the invention, of a combustion process operating nitrogen-free with a flamelessly operating combustion process. A synergic effect is achieved by means of the invention. Such an effect is not to be expected because the known combustion process operating with flameless combustion is used expressly for the reduction of the NO<sub>x</sub> emissions. These, however, do not exist at all in the case of a combustion process operating nitrogen-free and on which the invention is based. To this extent, the present invention uses the combustion process

operating with flameless combustion for a different purpose. This is because the use of the flameless combustion in a combustion process operating nitrogen-free permits reliable and stable combustion of a weakly reactive gas mixture.

(page 4, lines 3-24)

The Office Action, and the statements made in the Continuation Sheet of the Interview Summary Record for the telephonic interview conducted on 18 April 2007, reveal that Mr. Price has fallen victim to the reductionist (the practice of simplifying a complex idea, issue, condition, or the like, especially to the point of minimizing, obscuring, or distorting it) logic recently advanced in the patent law: because all inventions are formed from previously disclosed subcomponents or steps, combinations of those pre-existing pieces into a new whole invention are *ab initio*, *a priori* obvious. Of course, *KSR* cannot be read to endorse such illogic, and indeed, requires a rigorous, logical analysis; *KSR* merely reminded the U.S. patent community, in evaluating a claimed invention under section 103(a), not to be overly restrictive when looking for reasons why, or why not, a claimed invention might be obvious. But this is nothing new: M.P.E.P. § 2144, its progeny, and the underpinning case law, has long instructed the patent examining corps to look beyond the implicit and explicit disclosures in printed publications, to common knowledge, scientific reasoning, and the like, when analyzing the patentability of a claim under section 103(a). Abandoning that methodology is not what *KSR* stands for.

*Wunning* is not first to describe flameless combustion; Appellant is the first to combine flameless combustion with nitrogen-free pre-combustion gases to address specific problems.

The NO<sub>x</sub> levels reported by *Golomb* are tremendously low, essentially zero, and are far below the levels that the person of skill in the art would reasonably wish to attain. Upon a full and fair reading of *Golomb*, the person of ordinary skill in the art would find that the goal of achieving ultra-low NO<sub>x</sub> emissions by a combustor had already been achieved by *Golomb*'s plant. Therefore, contrary to the assertion in the Office Action, the person of ordinary skill in the art would have no reason to look for another way to eliminate NO<sub>x</sub> production; *Golomb* has already achieved it.

The Interview Summary points to column 2, lines 44-50 of *Golomb* for support. This

passage does not describe what *Golomb* achieves, but, rather, indicates a goal. *Golomb* merely is stating the obvious: if you don't want NO<sub>x</sub> emissions from your combustion process, reduce the N<sub>2</sub> content of the pre-combustion gases. Read *in toto*, *Golomb* plainly instructs the ordinarily skilled artisan to completely eliminate N<sub>2</sub> from the pre-combustion gases, and *Golomb* provides a detailed disclosure of how to do exactly that.

Furthermore, the starting point for application of *Wunning's* flameless combustion processes and devices is the presence of N<sub>2</sub> in the pre-combustion gases and the production of NO<sub>x</sub> by the combustion process. But, as discussed at length herein, *Golomb* does not have any N<sub>2</sub> in his pre-combustion gases, and produces no NO<sub>x</sub> in his flame-driven combustion. A person of ordinary skill in the relevant arts would, upon a full and fair reading of *Golomb* and *Wunning* together, find no application of *Wunning's* flameless combustion to *Golomb's* plant, because *Wunning's* goal of zero NO<sub>x</sub> production has already been achieved by *Golomb*. Stated somewhat differently, using *Wunning's* flameless combustion in *Golomb's* plant would be pointless to the person of ordinary skill in the art, because *Wunning* offers no improvement to *Golomb's* NO<sub>x</sub>-free system and process.

During the telephonic interview, the undersigned asked the following question: given that the factual predicate to the use of *Wunning's* process is the presence of nitrogen in the oxidant or fuel fed to a combustor, why would a person of skill in the art apply *Wunning's* flameless combustion process to *Golomb's* process, when *Golomb* does not introduce any nitrogen into the combustion chamber to begin with? The answer to that question is quite simple: by reading this inventor's application.

- (ii) The rejections of Claims 12-21 and 25-28 are in error

The rejections of Claims 12-21 and 25-28 under section 103(a) are in error.

Appellant first notes that *JP-614* was cited to allegedly show "in a low nitrogen oxide gas forming combustion system including flue gas recirculation, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to, for at least the purpose of eliminating the use of a pilot burner, preheat the combustible mixture to a temperature

greater than the spontaneous ignition temperature, or self-ignition temperature.” (Office Action, pages 4-5). Plainly, the foregoing statement fails to provide any rationale behind the conclusion of obviousness it reaches, and instead is simply conclusory. The figures of *JP-614* instead appear to suggest that the combustion products produced in the lower portion of the U-shaped chamber 3 are drawn backwards through the upper arm, and are directed out of the combustion chamber by the valve 10. Thus, those hot combustion gases, even if additionally heated in the upper portion of the U-shaped combustion chamber, are not exposed to the pre-combustion gases.

*Golomb* and *Wunning* fail to fairly suggest the claimed combination recited in Claim 12, and *JP-614* fails to make up for their deficiencies with respect thereto. As discussed at length above, the person of ordinary skill in the art, upon a full and fair reading of the prior art, would find *Golomb*’s NO<sub>x</sub>-free plant design to be entirely satisfying, leaving no desire or need to reduce NO<sub>x</sub> production: there is none to begin with. There simply is no reason to combine *Golomb*’s plant with *Wunning*’s flameless combustor, other than those described in Appellant’s application.

(iii) Conclusion

For at least the foregoing reasons, Appellant respectfully submits that the subject matters of Claims 1-28 would not have been obvious over *Golomb*, *Wunning*, and *JP-614*, and are therefore not unpatentable under 35 U.S.C. § 103(a).

*E. Claims 1-28 are patentable*

For at least the reasons presented herein, each of the subject matters of Claims 1-28, taken as a whole, is patentable over the prior art. Accordingly, the rejection of each of Claims 1-28 under section 103(a) is reversible error.



#### IV. CONCLUSION

For at least the foregoing reasons, Appellant respectfully submits that the rejections of the claims in this patent application are in error, and therefore respectfully requests reversal thereof.

Respectfully submitted,

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Date: 6 September 2007

## CLAIMS APPENDIX

1. A combustion process comprising:  
forming a substantially nitrogen-free gas mixture from oxidant, fuel, and inert gas; and  
combusting said gas mixture in a burner, wherein combusting comprises flameless  
combustion.
2. The process as claimed in claim 1,  
wherein said oxidant comprises substantially pure oxygen or a mixture of substantially  
pure oxygen and substantially nitrogen-free inert gas; and  
wherein said inert gas comprises a substantially nitrogen-free inert gas.
3. The process as claimed in claim 1, wherein the temperature of the gas mixture is above  
the self-ignition temperature of the gas mixture, and further comprising:  
forming an admixture in said burner, before said combusting, of:  
oxygen, or a mixture of oxygen and inert gas;  
fuel, or a mixture of fuel and inert gas;  
or both.
4. The process as claimed in claim 1, wherein the inert gas comprises a mixture of inert  
gases.
5. The process as claimed in claim 1, wherein, in the gas mixture, the volume ratio of inert  
gas to fuel and oxygen is greater than 1.5.
6. The method as claimed in claim 1, further comprising:  
forming the inert gas from an exhaust gas occurring during combusting of the gas  
mixture.

7. The method as claimed in claim 6, comprising:  
admixing exhaust gas to oxygen, to fuel, or both,  
with an internal exhaust gas recirculation system by retaining a part of the exhaust gases in a combustion space of the burner,  
with an external exhaust gas recirculation system by extracting a part of the exhaust gases after the burner and recirculating said part of the exhaust gases to before the burner, or  
both.
8. The method as claimed in claim 1, wherein forming comprises forming with cryotechnically produced, substantially pure oxygen.
9. The method as claimed in claim 1, wherein forming comprises:  
forming with a mixture of substantially pure oxygen and inert gas, including extracting oxygen with an oxygen transport membrane from an oxygen-containing gas mixture arranged on a retentate side of the membrane, and transporting said extracted oxygen to a permeate side of the membrane, and removing said transported oxygen by scavenging with the inert gas.
10. The method as claimed in claim 1, wherein forming the gas mixture comprises mixing the fuel or a mixture of fuel and inert gas at least at two locations in the burner arranged sequentially relative to a through-flow direction of the burner.
11. The method as claimed in claim 1, further comprising:  
precombusting a partial quantity of the oxygen and a partial quantity of the fuel to increase the mixture temperature in the burner, to increase the exhaust gas proportion in the gas mixture before a main combustion space, or both, said precombusting being catalytically initiated, stabilized, or both.

12. An installation useful for carrying out a process as claimed in claim 1, comprising:  
a mixture forming device configured and arranged for the formation of a substantially nitrogen-free gas mixture of oxidant, fuel, and inert gas, and a burner configured and arranged for carrying out flameless combustion, the mixture forming device configured and arranged to bring oxygen and fuel together in the burner first to form a gas mixture having a temperature above the self-ignition temperature of said gas mixture.
13. The installation as claimed in claim 12, further comprising:  
an exhaust gas recirculation system; and  
wherein the inert gas is formed by the exhaust gas resulting during the combustion of the gas mixture.
14. The installation as claimed in claim 13, wherein the burner comprises a combustion space, and wherein the exhaust gas recirculation system comprises:  
an internal exhaust gas recirculation system configured and arranged to retain a part of the exhaust gases in the combustion space of the burner;  
an external exhaust gas recirculation system configured and arranged to extract a part of the exhaust gases after the burner and to recirculate said extracted part of the exhaust gases to before the burner; or  
both.
15. The installation as claimed in claim 14, wherein the internal exhaust gas recirculation system includes a swirler device configured and arranged to swirl a gas flow of oxygen or a mixture of oxygen and exhaust gas before, or at an entry into, a combustion space of the burner.
16. The installation as claimed in claim 14, wherein the internal exhaust gas recirculation system comprises, in a combustion space of the burner, an exhaust gas guidance device

configured and arranged to effect or support a reverse flow of a part of the exhaust gases within the combustion space against the through-flow direction of the burner.

17. The installation as claimed in claim 12, wherein the burner comprises an upstream precombustion space and a downstream main combustion space, and further comprising:

a fuel injection device configured and arranged to introduce fuel both in the burner upstream precombustion space and in the burner downstream main combustion space.

18. The installation as claimed in claim 17, wherein the fuel injection device comprises a lance extending centrally in the burner upstream precombustion space and in the burner downstream main combustion space, and has upstream injection nozzles associated with the burner upstream precombustion space and downstream injection nozzles associated with the burner downstream main combustion space, wherein said burner upstream and downstream injection nozzles are configured and arranged to introduce fuel into the burner upstream precombustion space and into the burner downstream main combustion space, respectively.

19. The installation as claimed in claim 17, further comprising:

a catalyzer arranged in the burner upstream precombustion space, said catalyzer configured and arranged to at least partially burn fuel and oxygen when introduced into the burner upstream precombustion space.

20. The installation as claimed in claim 12, wherein the mixture forming device includes an oxygen separating device with an oxygen transport membrane, the membrane including a retentate side and a permeate side, the membrane configured and arranged to extract oxygen from an oxygen-containing gas mixture when arranged on the retentate side of the membrane and to transport said oxygen to the permeate side of the membrane, and further comprising:

a scavenging gas comprising exhaust gas positioned to scavenge said transported oxygen.

21. The installation as claimed in claim 12, wherein the burner comprises a combustion space, and wherein the mixture forming device is configured and arranged to introduce substantially pure oxygen into the burner combustion space near a location at which fuel or a mixture of fuel and inert gas is introduced into the combustion space, and further comprising:  
an internal exhaust gas recirculation system configured and arranged to retain a part of exhaust gases in the combustion space and to supply the retained exhaust gases as inert gas lacking for the formation of the gas mixture.
22. The process as claimed in claim 1, wherein the combustion process comprises a combustion process for generating electrical current, heat or both.
23. The process as claimed in claim 1, wherein combusting consists essentially of flameless combusting.
24. The process as claimed in claim 5, wherein the volume ratio of inert gas to fuel and oxygen is about 2.5.
25. A system comprising:  
a gas turbine installation comprising an installation according to Claim 12.
26. An installation as claimed in claim 16, wherein the exhaust gas guidance device comprises a cross-sectional expansion.
27. An installation as claimed in claim 19, further comprising:  
a catalyzing device comprising said catalyzer.
28. An installation as claimed in claim 20, further comprising:

an external exhaust gas recirculation system configured and arranged to deliver said exhaust gas to said membrane.

**EVIDENCE APPENDIX**

No additional evidence is cited in this Brief.



**RELATED PROCEEDINGS APPENDIX**

There are no proceedings related to this application or appeal.